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Half-Yearly Examination - 2019

BUSINESS MATHEMATICS

Time : 3.00 hrs.

Max. Marks : 90

Instructions : 1) Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately. 2) Use Blue or Black ink to write and underline and pencil to draw diagrams.

PART - I

Note : i) Answer all the questions.

ii) Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer.

20 x 1 = 20

1. If $A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$ such that $ad - bc \neq 0$. Then A^{-1} is

   a) $\dfrac{1}{ad-bc}\begin{pmatrix} d & b \\ -c & a \end{pmatrix}$ b) $\dfrac{1}{ad-bc}\begin{pmatrix} d & b \\ c & a \end{pmatrix}$ c) $\dfrac{1}{ad-bc}\begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$ d) $\dfrac{1}{ad-bc}\begin{pmatrix} d & -b \\ c & a \end{pmatrix}$

2. If n is the order of a matrix A, then $|Adj\ A| = $ a) $|A|^n$ b) $|A|^{n-1}$ c) $|A|^{n-2}$ d) $|A|^{n-3}$
3. Sum of the binomial coefficients is   a) 2^n b) n^2 c) 2n d) n + 17
4. The no. of permutations of English words A, E, I, O, U taking two at a time a) 20 b) 120 c) 5 d) 2
5. The double ordinate passing through the focus is a) focal chord b) latus rectum c) directrix d) axis
6. In a pair of straight lines, if the lines are perpendicular then   a) ab = 0 b) a – b = 0 c) a + b = 0 d) none of these
7. The value of $\sin(-420^0)$ is ....a) $\dfrac{\sqrt{3}}{2}$ b) $-\dfrac{\sqrt{3}}{2}$ c) $\dfrac{1}{2}$ d) $-\dfrac{1}{2}$
8. The domain of $\sin^{-1} x$: a) $[-1, 1]$ b) $\left[-\dfrac{\pi}{2}, \dfrac{\pi}{2}\right]$ c) $(-\infty, \infty)$ d) $[0, \pi]$
9. The graph of $y = e^x$ intersects the y-axis at a) (1, 1) b) (0, 0) c) (1, 0) d) (0, 1)
10. If $f(x) = x^n$, $f^1(1) = 5$. Then the value of n is a) 5 b) 10 c) 25 d) 1
11. For the cost function $C = \dfrac{1}{25} e^{5x}$, the marginal cost is a) $\dfrac{1}{25}$ b) $\dfrac{1}{5} e^{5x}$ c) $\dfrac{1}{125} e^{5x}$ d) $25e^{5x}$
12. The graph of demand function lies in a) I Quadrant b) II Quadrant c) III Quadrant d) IV Quadrant
13. An annuity in which payments are made at the beginning of each payment period is called
    a) Annuity due b) An immediate annuity c) Perpetual annuity d) none of these
14. When a stock is purchased, brokerage is ....to the cost price. a) added b) subtracted c) multiplied d) dividend
15. Harmonic mean is better than other means if the data are for
    a) speed or rates b) heights or lengths c) binary values like 0 and 1 d) ratios of proportions
16. If A and B are two events such that $P(A) \neq 0$. Then P(B/A) if $A \cap B = \phi$ is a) 1 b) 0 c) 0.5 d) 0.25
17. If $cov(x, y) = -16.5$, $\sigma^2_x = 2.89$, $\sigma^2_y = 100$. Find the correlation coefficient. a) –0.12 b) 0.001 c) –1 d) –0.97
18. If $r(x, y) = 0$ the variables x and y are said to be
    a) positive correlations b) negative correlation c) no correlation d) perfect positive correlation
19. The variable which influence the values or is used for prediction is called
    a) dependent variable b) independent variable c) explained variable d) regressed
20. The objective of network analysis is to a) minimize total project cost b) minimize total project duration
    c) minimize production delays, interruption and conflicts d) all the above

PART - II

Note : Answer any seven questions in which question no.30 is compulsory.

7 x 2 = 14

21. Evaluate : $\begin{vmatrix} x & x+2 \\ x-2 & x \end{vmatrix}$
22. Find the distance of the point (4, 1) from the line $3x - 4y + 12 = 0$.
23. Find the combined equation of the given straight lines whose separate equations are :
    $2x + y - 7 = 0$ and $x + 2y - 1 = 0$.
24. Differentiate : $x^6 - 4\sin x + 7 \cos x + e^{-4x}$.
25. Which is better investment, 20% stock at ₹140 or 10% stock at ₹70?
26. The price of a commodity increased by 5% from 2004 to 2005, 8% from 2005 to 2006 and 77% from 2006 to 2007. Calculate the average increase from 2004 to 2007.
27. A family has two children. What is the probability that at least one of them is a girl and the both the children are girls?
28. From the following data calculate the correlation coefficient $\Sigma xy = 120$, $\Sigma x^2 = 90$, $\Sigma y^2 = 640$.
29. Write the regression equation for X on Y and Y on X.
30. The total cost function for the production of x units of an item is $C = 10 - 4x^5 + 3x^6$. Find
    i) Average cost function ii) Marginal cost function

PART - III

Note : Answer any 7 questions in which question no.40 is compulsory.

7 x 3 = 21

31. A question paper has two parts namely Part A and Part B. Each Part contains 10 questions. If the student has to choose 8 from Part A and 5 from Part B, in how many ways can he choose the questions?

32. Find the value of k so that the line $3x + 4y - k = 0$ is a tangent to $x^2 + y^2 - 64 = 0$

33. Prove that : $\sin^2 \dfrac{\pi}{6} + \cos^2 \dfrac{\pi}{3} - \tan^2 \dfrac{\pi}{4} = -\dfrac{1}{2}$

34. Differentiate : $x^2 \sin x$ with respect to x.

35. Differentiate $\sin^2 x$ with respect to x^2.

36. Find the equilibrium price and equilibrium quantity for the following functions :
    Demand : $x = 100 - 2p$ and Supply : $x = 3p - 50$.

37. Find the amount of annuity of ₹5,000 payable at the end of each year for 4 years of money is worth 10% compounded annually. $[(1.1)^4 = 1.4641]$

38. A bag contains 5 white and 3 black balls. Two balls are drawn at random one after the other without replacement. Find the probability that both balls drawn are black.

39. A company produces two types of products, say type A and B. Profits on the two types of product are 30 and 40 per kg, respectively. The data on resources required and availability of resources are given below.

	Requirements		Capacity available per month
	Product A	Product B	
Raw material (kgs)	60	120	12000
Machining (hours/piece)	8	5	600
Assemhbling (man hours)	3	4	500

Formulate this problem as a linear programming problem to maximize the profit.

40. If two lines of regression are $3x - 2y + 1 = 0$ and $2x - y - 2 = 0$. Find $\overline{X}$ and $\overline{Y}$.

PART - IV

Note : Answer all the questions. $7 \times 5 = 35$

41. a) The sum of three numbers is 20. If we multiply the first by 2 and add the second number and subtract the third, we get 23. If we multiply the first by 3 and add second and third to it, we get 46. By using matrix inversion method, find the numbers. **(OR)**
    b) Show that the pair of straight lines $4x^2 - 12xy + 9y^2 + 18x - 27y + 8 = 0$ represents a pair of parallel straight lines and find their separate equations.

42. a) A committe of 5 is to be formed out of 6 gents and 4 ladies. In how many ways this can be done when
    i) at least two ladies are included   ii) atmost two ladies are included. **(OR)**
    b) If $A + B = 45^0$, prove that $(1 + \tan A)(1 + \tan B) = 2$ and hence deduce the value of $\tan 22\frac{1}{2}^0$.

43. a) If $X = \begin{bmatrix} 8 & -1 & -3 \\ -5 & 1 & 2 \\ 10 & -1 & -4 \end{bmatrix}$ and $Y = \begin{bmatrix} 2 & 1 & -1 \\ 0 & 2 & 1 \\ 5 & p & q \end{bmatrix}$ $\dfrac{2x+1}{(x-1)(x^2+1)}$ then, find p, q if $Y = X^{-1}$. **(OR)**

    b) Differentiate $\sqrt{\dfrac{(x+2)(x^2-8)}{4x^2-6x-7}}$

44. a) For a demand function $p = 550 - 3x - 6x^2$, where x is quantity demand and p is unit price. Show that $MR = p\left[1 - \dfrac{1}{\eta_d}\right]$ **(OR)**

    b) A company has three machines A, B, C which produces 20%, 30% and 50% of the product respectively. Their respective defective percentages are 7, 3 and 5. From these products one is chosen and inspected. If it is defective, what is the probability that it has been made by machine C?

45. a) Kamal sold ₹9,000 worth 7% stock at 80 and invested the proceeds in 15% stock at 120. Find the change in income. **(OR)**
    b) A company uses 48,000 units of raw material costing ₹2.50 per unit. Placing each order costs ₹45 and the carrying cost is 10.8% per year of the average inventory. Find the EOQ total number of orders oper year and time between each order. Also verify that EOQ carrying cost is equal to ordering cost.

46. a) Obtain regression equation of y on x and estimate y, when $x = 55$ from the following.

x	40	50	38	60	65	50	35
y	38	60	55	70	60	48	30

    b) Solve the following LPP by graphical method. Minimize $z = 5x_1 + 4x_2$
    subject to constraints $4x_1 + x_2 \geq 40$; $2x_1 + 3x_2 \geq 90$ and $x_1, x_2 \geq 0$.

47. a) Resolve into partial fractions : $\dfrac{2x+1}{(x-1)(x^2+1)}$ **(OR)**
    b) Compute the earliest start time, earliest finish time, laterst start time and latest finish time of each activity of the project given below :

Activity	1-2	1-3	2-4	2-5	3-4	4-5
Duration (in days)	8	4	10	2	5	3